

SEQUENCE LISTING

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<120> METHODS AND COMPOSITIONS FOR PRODUCTION OF FLAVONOID
AND ISOFLAVONOID NUTRACEUTICALS

<130> NBLE:007US

<140> UNKNOWN
<141> 2003-09-10

<150> 60/409,447
<151> 2002-09-10

<160> 14

<170> PatentIn Ver. 2.1

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<212> DNA
<213> Soybean

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Pro Asn Pro Pro Ser Pro Lys Pro Arg Leu Pro Phe Ile Gly His Leu
35 40 45

His Leu Leu Lys Asp Lys Leu Leu His Tyr Ala Leu Ile Asp Leu Ser
50 55 60

Lys Lys His Gly Pro Leu Phe Ser Leu Tyr Phe Gly Ser Met Pro Thr
65 70 75 80

Val Val Ala Ser Thr Pro Glu Leu Phe Lys Leu Phe Leu Gln Thr His
85 90 95

Glu Ala Thr Ser Phe Asn Thr Arg Phe Gln Thr Ser Ala Ile Arg Arg
100 105 110

Leu Thr Tyr Asp Ser Ser Val Ala Met Val Pro Phe Gly Pro Tyr Trp
115 120 125

Lys Phe Val Arg Lys Leu Ile Met Asn Asp Leu Pro Asn Ala Thr Thr
130 135 140

Val Asn Lys Leu Arg Pro Leu Arg Thr Gln Gln Thr Arg Lys Phe Leu
145 150 155 160

Arg Val Met Ala Gln Gly Ala Glu Ala Gln Lys Pro Leu Asp Leu Thr
165 170 175

Glu Glu Leu Leu Lys Trp Thr Asn Ser Thr Ile Ser Met Met Met Leu
180 185 190

Gly Glu Ala Glu Glu Ile Arg Asp Ile Ala Arg Glu Val Leu Lys Ile
195 200 205

Phe Gly Glu Tyr Ser Leu Thr Asp Phe Ile Trp Pro Leu Lys His Leu
210 215 220

Lys Val Gly Lys Tyr Glu Lys Arg Ile Asp Asp Ile Leu Asn Lys Phe
225 230 235 240

Asp Pro Val Val Glu Arg Val Ile Lys Lys Arg Arg Glu Ile Val Arg
245 250 255

Arg Arg Lys Asn Gly Glu Val Val Glu Gly Glu Val Ser Gly Val Phe
260 265 270

Leu Asp Thr Leu Leu Glu Phe Ala Glu Asp Glu Thr Met Glu Ile Lys
275 280 285

Ile Thr Lys Asp His Ile Glu Gly Leu Val Val Asp Phe Phe Ser Ala
290 295 300

Gly Thr Asp Ser Thr Ala Val Ala Thr Glu Trp Ala Leu Ala Glu Leu
305 310 315 320

Ile Asn Asn Pro Lys Val Leu Glu Lys Ala Arg Glu Glu Val Tyr Ser
325 330 335

Val Val Gly Lys Asp Arg Leu Val Asp Glu Val Asp Thr Gln Asn Leu
340 345 350

Pro Tyr Ile Arg Ala Ile Val Lys Glu Thr Phe Arg Met His Pro Pro
355 360 365

Leu Pro Val Val Lys Arg Lys Cys Thr Glu Glu Cys Glu Ile Asn Gly
370 375 380

Tyr Val Ile Pro Glu Gly Ala Leu Ile Leu Phe Asn Val Trp Gln Val
385 390 395 400

Gly Arg Asp Pro Lys Tyr Trp Asp Arg Pro Ser Glu Phe Arg Pro Glu
405 410 415

Arg Phe Leu Glu Thr Gly Ala Glu Gly Glu Ala Gly Pro Leu Asp Leu
420 425 430

Arg Gly Gln His Phe Gln Leu Leu Pro Phe Gly Ser Gly Arg Arg Met
435 440 445

Cys Pro Gly Val Asn Leu Ala Thr Ser Gly Met Ala Thr Leu Leu Ala
450 455 460

Ser Leu Ile Gln Cys Phe Asp Leu Gln Val Leu Gly Pro Gln Gly Gln
465 470 475 480

Ile Leu Lys Gly Gly Asp Ala Lys Val Ser Met Clu Glu Arg Ala Gly
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<213> *Medicago sativa*

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<222> (41)..(709)

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Thr Ala Ile Thr Val Glu Asn Leu Glu Tyr Pro Ala Val Val Thr Ser
10 15 20

ccg gtc acc ggc aaa tca tat ttc ctc ggt ggc gct ggg gag aga gga 151
Pro Val Thr Gly Lys Ser Tyr Phe Leu Gly Ala Gly Glu Arg Gly
25 30 35

ttg acc att gaa gga aac ttc atc aag ttc act gcc ata ggt gtt tat 199
Leu Thr Ile Glu Gly Asn Phe Ile Lys Phe Thr Ala Ile Gly Val Tyr
40 45 50

ttg gaa gat ata gca gtg gct tca cta gct gcc aaa tgg aag ggt aaa		247
Leu Glu Asp Ile Ala Val Ala Ser Leu Ala Ala Lys Trp Lys Gly Lys		
55	60	65
tca tct gaa gag tta ctt gag acc ctt gac ttt tac aga gac atc atc		295
Ser Ser Glu Glu Leu Leu Glu Thr Leu Asp Phe Tyr Arg Asp Ile Ile		
70	75	80
85		
tca ggt ccc ttt gaa aag tta att aga ggg tca aag att agg gaa ttg		343
Ser Gly Pro Phe Glu Lys Leu Ile Arg Gly Ser Lys Ile Arg Glu Leu		
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Ser Gly Pro Glu Tyr Ser Arg Lys Val Met Glu Asn Cys Val Ala His		
105	110	115
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120	125	130
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165		
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Pro Asp Thr Ser Ile Pro Glu Lys Glu Ala Ala Leu Ile Glu Asn Lys		
170	175	180
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Ala Val Ser Ser Ala Val Leu Glu Thr Met Ile Gly Glu His Ala Val		
185	190	195
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Ser Pro Asp Leu Lys Arg Cys Leu Ala Ala Arg Leu Pro Ala Leu Leu		
200	205	210
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Asn Glu Gly Ala Phe Lys Ile Gly Asn		
215	220	
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acgtttaatt ttttgtatat ctatttacct tcttatttagt atcaataata tgaaatgaaa		849

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<213> *Medicago sativa*

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Ala Ile Gly Val Tyr Leu Glu Asp Ile Ala Val Ala Ser Leu Ala Ala

50 55 60

Lys Trp Lys Gly Lys Ser Ser Glu Glu Leu Leu Glu Thr Leu Asp Phe

65 70 75 80

Tyr Arg Asp Ile Ile Ser Gly Pro Phe Glu Lys Leu Ile Arg Gly Ser

85 90 95

Lys Ile Arg Glu Leu Ser Gly Pro Glu Tyr Ser Arg Lys Val Met Glu

100 105 110

Asn Cys Val Ala His Leu Lys Ser Val Gly Thr Tyr Gly Asp Ala Glu

115 120 125

Ala Glu Ala Met Gln Lys Phe Ala Glu Ala Phe Lys Pro Val Asn Phe

130 135 140

Pro Pro Gly Ala Ser Val Phe Tyr Arg Gln Ser Pro Asp Gly Ile Leu

145 150 155 160

Gly Leu Ser Phe Ser Pro Asp Thr Ser Ile Pro Glu Lys Glu Ala Ala

165 170 175

Leu Ile Glu Asn Lys Ala Val Ser Ser Ala Val Leu Glu Thr Met Ile

180 185 190

Gly Glu His Ala Val Ser Pro Asp Leu Lys Arg Cys Leu Ala Ala Arg

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<212> DNA

<213> *Medicago sativa*

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1 5 10

ggt cct gca acc att ttg gcc att ggc act gca aat cca gca aat tgt 156
Gly Pro Ala Thr Ile Leu Ala Ile Gly Thr Ala Asn Pro Ala Asn Cys
15 20 25 30

gtt gaa caa agt aca tat cct gat ttt tac ttt aaa atc aca aat agc 204
Val Glu Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser
35 40 45

gag cac aag act gaa ctc aaa gag aaa ttc caa cgc atg tgt gat aaa 252
Glu His Lys Thr Glu Leu Lys Glu Lys Phe Gln Arg Met Cys Asp Lys
50 55 60

tct atg atc aag agg aga tac atg tac cta aca gag gag att ttg aaa 300
Ser Met Ile Lys Arg Arg Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys
65 70 75

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Glu Asn Pro Ser Val Cys Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg			
80	85	90	
caa gac atg gtg gtg gta gag gta cct aga cta ggg aag gag gct gca			396
Gln Asp Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala			
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Val Lys Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His			
115	120	125	
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Leu Ile Val Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr			
130	135	140	
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Gln Leu Thr Lys Leu Leu Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met			
145	150	155	
atg tac caa caa ggt tgc ttt gca gga ggc acg gtg ctt cgt ttg gct			588
Met Tyr Gln Gln Gly Cys Phe Ala Gly Gly Thr Val Leu Arg Leu Ala			
160	165	170	
aaa gat ttg gct gag aac aac aaa ggt gcc cgt gta ttg gtt gtt tgt			636
Lys Asp Leu Ala Glu Asn Asn Lys Gly Ala Arg Val Leu Val Val Cys			
175	180	185	190
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Asp Ser Leu Val Gly Gln Ala Leu Phe Gly Asp Gly Ala Ala Leu			
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Ile Val Gly Ser Asp Pro Val Pro Glu Ile Glu Lys Pro Ile Phe Glu			
225	230	235	
atg gtt tgg act gca caa aca att gct cca gat agt gaa gga gcc att			828
Met Val Trp Thr Ala Gln Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile			
240	245	250	
gat ggt cac ctt cgt gaa gct gga cta aca ttc cac ctt ctt aaa gat			876
Asp Gly His Leu Arg Glu Ala Gly Leu Thr Phe His Leu Leu Lys Asp			
255	260	265	270

gtt cct ggg att gtt tca aag aac att gat aaa gca tta gtt gaa gct			924
Val Pro Gly Ile Val Ser Lys Asn Ile Asp Lys Ala Leu Val Glu Ala			
275	280	285	
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Phe Gln Pro Leu Gly Ile Ser Asp Tyr Asn Ser Ile Phe Trp Ile Ala			
290	295	300	
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His Pro Gly Gly Pro Ala Ile Leu Asp Gln Val Glu Gln Lys Leu Ala			
305	310	315	
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Leu Lys Pro Glu Lys Met Arg Ala Thr Arg Glu Val Leu Ser Glu Tyr			
320	325	330	
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Gly Asn Met Ser Ser Ala Cys Val Leu Phe Ile Leu Asp Glu Met Arg			
335	340	345	350
 aag aaa tca actcaa gat gga ctg aag aca aca gga gaa gga ctt gaa			1164
Lys Lys Ser Thr Gln Asp Gly Leu Lys Thr Thr Gly Glu Gly Leu Glu			
355	360	365	
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Trp Gly Val Leu Phe Gly Phe Gly Pro Gly Leu Thr Ile Glu Thr Val			
370	375	380	
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Val Leu Arg Ser Val Ala Ile			
385	390		
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Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His			

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Ile Lys Arg Arg Tyr Met	Tyr Leu Thr Glu Glu Ile Leu Lys Glu Asn	
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Pro Ser Val Cys Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg Gln Asp		
85	90	95
Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys		
100	105	110
Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile		
115	120	125
Val Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu		
130	135	140
Thr Lys Leu Leu Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met Met Tyr		
145	150	155
Gln Gln Gly Cys Phe Ala Gly Gly Thr Val Leu Arg Leu Ala Lys Asp		
165	170	175
Leu Ala Glu Asn Asn Lys Gly Ala Arg Val Leu Val Val Cys Ser Glu		
180	185	190
Val Thr Ala Val Thr Phe Arg Gly Pro Ser Asp Thr His Leu Asp Ser		
195	200	205
Leu Val Gly Gln Ala Leu Phe Gly Asp Gly Ala Ala Ala Leu Ile Val		
210	215	220
Gly Ser Asp Pro Val Pro Glu Ile Glu Lys Pro Ile Phe Glu Met Val		
225	230	235
Trp Thr Ala Gln Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile Asp Gly		
245	250	255
His Leu Arg Glu Ala Gly Leu Thr Phe His Leu Leu Lys Asp Val Pro		
260	265	270
Gly Ile Val Ser Lys Asn Ile Asp Lys Ala Leu Val Glu Ala Phe Gln		
275	280	285
Pro Leu Gly Ile Ser Asp Tyr Asn Ser Ile Phe Trp Ile Ala His Pro		
290	295	300
Gly Gly Pro Ala Ile Leu Asp Gln Val Glu Gln Lys Leu Ala Leu Lys		
305	310	315
Pro Glu Lys Met Arg Ala Thr Arg Glu Val Leu Ser Glu Tyr Gly Asn		
325	330	335
Met Ser Ser Ala Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Lys		
340	345	350
Ser Thr Gln Asp Gly Leu Lys Thr Thr Gly Glu Gly Leu Glu Trp Gly		
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<220>
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<222> (106)..(1275)

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Met Val Ser Val
1

tct gaa att cgt cag gct caa agg gca gaa ggc cct gca acc atc atg 165
Ser Glu Ile Arg Gln Ala Gln Arg Ala Glu Gly Pro Ala Thr Ile Met
5 10 15 20

gcc att ggc act gca aat cca tcc aac tgt gtt gaa caa agc aca tat 213
Ala Ile Gly Thr Ala Asn Pro Ser Asn Cys Val Glu Gln Ser Thr Tyr
25 30 35

cct gat ttc tac ttc aaa atc aca aac agt gag cac aaa gtt gaa ctc 261
Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His Lys Val Glu Leu
40 45 50

aaa gag aaa ttt caa cgc atg tgt gat aaa tcc atg atc aag agg aga 309
Lys Glu Lys Phe Gln Arg Met Cys Asp Lys Ser Met Ile Lys Arg Arg
55 60 65

tac atg tat ctt acc gaa gag att ttg aaa gaa aat cca agt gta tgt 357
Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys Glu Asn Pro Ser Val Cys
70 75 80

gaa tac atg gca cct tca ttg gat gct agg cag gac atg gtg gta 405
Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg Gln Asp Met Val Val Val
85 90 95 100

gag gta cct aga ctt gga aag gag gct gca gtg aag gct ata aaa gaa 453
Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys Ala Ile Lys Glu
105 110 115

tgg ggc caa cca aaa tca aag att aca cac tta ata ttt tgt acc aca 501
Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile Phe Cys Thr Thr
120 125 130

agt ggt gta gac atg cct ggt gcc gat tac caa ctc aca aaa ctc tta			549
Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu Thr Lys Leu Leu			
135	140	145	
ggt ctt cgt cca tat gtg aaa agg tat atg atg tac caa caa ggg tgc			597
Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met Met Tyr Gln Gln Gly Cys			
150	155	160	
ttt gca ggt ggg acg gtc ctt cgt ttg gcc aag gac ttg gct gag aac			645
Phe Ala Gly Gly Thr Val Leu Arg Leu Ala Lys Asp Leu Ala Glu Asn			
165	170	175	180
aat aaa ggt gct cgt gtg ttg gtt tgt tct gaa gtt act gcg gtg			693
Asn Lys Gly Ala Arg Val Leu Val Val Cys Ser Glu Val Thr Ala Val			
185	190	195	
aca ttc cgt ggt cct agt gat act cat tta gac agt ctt gtt gga caa			741
Thr Phe Arg Gly Pro Ser Asp Thr His Leu Asp Ser Leu Val Gly Gln			
200	205	210	
gca ctc ttt gga gat ggt gct gct gca ctc att gtt ggt tct gac cca			789
Ala Leu Phe Gly Asp Gly Ala Ala Leu Ile Val Gly Ser Asp Pro			
215	220	225	
ata cca gaa att gag aaa cct ata ttt gag atg gtt tgg act gca caa			837
Ile Pro Glu Ile Glu Lys Pro Ile Phe Glu Met Val Trp Thr Ala Gln			
230	235	240	
aca att gct cca gac agt gaa gga gcc att gat ggt cac ctt gtc gaa			885
Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile Asp Gly His Leu Val Glu			
245	250	255	260
gct ggt cta aca ttt cac ctt aaa gat gtt cct ggg att gtt tca			933
Ala Gly Leu Thr Phe His Leu Leu Lys Asp Val Pro Gly Ile Val Ser			
265	270	275	
aag aac att gat aaa gca ttg att gag gct ttc caa cca tta aac atc			981
Lys Asn Ile Asp Lys Ala Leu Ile Glu Ala Phe Gln Pro Leu Asn Ile			
280	285	290	
tct gat tac aat tca atc ttc tgg att gct cac cca ggt gga ccc gca			1029
Ser Asp Tyr Asn Ser Ile Phe Trp Ile Ala His Pro Gly Gly Pro Ala			
295	300	305	
att cta gac caa gtt gaa gaa aag tta ggc tta aaa cct gaa aag atg			1077
Ile Leu Asp Gln Val Glu Glu Lys Leu Gly Leu Lys Pro Glu Lys Met			
310	315	320	

aag gcc act agg gaa gta ctt agt gaa tat ggt aac atg tca agt gca			1125
Lys Ala Thr Arg Glu Val Leu Ser Glu Tyr Gly Asn Met Ser Ser Ala			
325	330	335	340
tgt gta ttg ttc atc tta gat gag atg aga aag aaa tcg gca caa gcg			1173
Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Ser Ala Gln Ala			
345	350	355	
gga ctt aaa acc aca gga gaa ggc ctt gac tgg ggt gtg ttg ttt ggc			1221
Gly Leu Lys Thr Thr Gly Glu Gly Leu Asp Trp Gly Val Leu Phe Gly			
360	365	370	
ttc gga cct gga ctt acc att gaa acc gtt gtt ctc cat agc gtg gct			1269
Phe Gly Pro Gly Leu Thr Ile Glu Thr Val Val Leu His Ser Val Ala			
375	380	385	
ata tga aatgatttat ttttttattt tattgtatta cttttaact tgcttgaaat			1325
Ile			
390			
tccatgttaag aataaataca gagttcatgt accatggatg taaaaacgaa tataccattt			1385
gttagcttctt ctttttctcg caaaaaaaaaa aggaattc			1423

<210> 9
<211> 389
<212> PRT
<213> *Medicago sativa*

<400> 9			
Met Val Ser Val Ser Glu Ile Arg Gln Ala Gln Arg Ala Glu Gly Pro			
1	5	10	15
Ala Thr Ile Met Ala Ile Gly Thr Ala Asn Pro Ser Asn Cys Val Glu			
20	25	30	
Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His			
35	40	45	
Lys Val Glu Leu Lys Glu Lys Phe Gln Arg Met Cys Asp Lys Ser Met			
50	55	60	
Ile Lys Arg Arg Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys Glu Asn			
65	70	75	80
Pro Ser Val Cys Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg Gln Asp			
85	90	95	
Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys			
100	105	110	
Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile			
115	120	125	
Phe Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu			

130	135	140
Thr Lys Leu Leu Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met Met Tyr		
145	150	155
Gln Gln Gly Cys Phe Ala Gly Gly Thr Val Leu Arg Leu Ala Lys Asp		
165	170	175
Leu Ala Glu Asn Asn Lys Gly Ala Arg Val Leu Val Val Cys Ser Glu		
180	185	190
Val Thr Ala Val Thr Phe Arg Gly Pro Ser Asp Thr His Leu Asp Ser		
195	200	205
Leu Val Gly Gln Ala Leu Phe Gly Asp Gly Ala Ala Ala Leu Ile Val		
210	215	220
Gly Ser Asp Pro Ile Pro Glu Ile Glu Lys Pro Ile Phe Glu Met Val		
225	230	235
Trp Thr Ala Gln Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile Asp Gly		
245	250	255
His Leu Val Glu Ala Gly Leu Thr Phe His Leu Leu Lys Asp Val Pro		
260	265	270
Gly Ile Val Ser Lys Asn Ile Asp Lys Ala Leu Ile Glu Ala Phe Gln		
275	280	285
Pro Leu Asn Ile Ser Asp Tyr Asn Ser Ile Phe Trp Ile Ala His Pro		
290	295	300
Gly Gly Pro Ala Ile Leu Asp Gln Val Glu Glu Lys Leu Gly Leu Lys		
305	310	315
Pro Glu Lys Met Lys Ala Thr Arg Glu Val Leu Ser Glu Tyr Gly Asn		
325	330	335
Met Ser Ser Ala Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Lys		
340	345	350
Ser Ala Gln Ala Gly Leu Lys Thr Thr Gly Glu Gly Leu Asp Trp Gly		
355	360	365
Val Leu Phe Gly Phe Gly Pro Gly Leu Thr Ile Glu Thr Val Val Leu		
370	375	380
His Ser Val Ala Ile		
385		

<210> 10
 <211> 1242
 <212> DNA
 <213> Arabidopsis thaliana

<400> 10
 ctcaactcta aattcgtccg agacgaagac gaacgcccta aagtgcctta caatgtgttt 60
 agcgacgaaa tccccgtgat ctctctcgcc ggtatcgatg acgtcgatgg aaaaagagga 120
 gagatctgcc gtcagatcgt cgaggcttgt gagaattggg gtatcttcca agtggttgat 180
 cacggcgatcg atactaactt ggtggcgat atgactcgcc tcgctcgatg cttctttgt 240
 ttacctccgg aagacaagct ccgtttcgac atgtccggat gtaaaaaagg tggattcatc 300
 gtctctagtc acctccaggt aaaagccaca ccacaatctt cttagttaaa tacgttaatta 360

tgtttaatc ttgccgttaa agacataata attatactat aaatacaggg agaggctgtg 420
caagattgga gagagattgt aacgtatttc tcgtacccgg tgagaaacag agactactca 480
cggtggccaa ataaggctga aggatgggtg aaagtgcacgg aggagtatacg tgagaggctt 540
atgagttgg cttgtaagct tcttgagggtt ttgtctgaag ctatgggtct tgagaaagag 600
tctcttacca atgcatgcgt cgatatggac caaaagattt tggttaatta ttaccaaaaa 660
tgccctcagc ctgatctcac cctcggactc aagcgtcaca ctgaccctgg aaccattacc 720
ttgctgtac aagaccaagt cggtggatta caagccacac gtgacaatgg caagacctgg 780
attacggttc agcctgttga aggagcgttt gtcgtcaatc tcggcgacca cggcatgtt 840
agtactctat ccatttatttgc gctttttgtt ttctctgttt ttgggtttga cttggcaac 900
cttgatttgtt cttgatgaag ttttgagca atggaggtt caagaatgct gatcatcagg 960
ccgtggtaa ctctaactcg agcagattat ccatagccac gttccagaac cccgcgcgg 1020
atgccacagt gatatccactg aaagtaagag aaggagagaa ggcaatattt gaggagccaa 1080
tcacggttgc cgagatgtat aagagaaaga tgggaagaga tttggagctt gctcgccctca 1140
agaagctggc taaagaggag cgtgaccaca aagaagttgc caagcctgtc gaccaaattct 1200
tcgcttagaa tctctgttgc cttgcttact tgttgttgc tt 1242

<210> 11
<211> 342
<212> PRT
<213> Oryza sativa

<400> 11
Met Ala Ala Glu Ala Glu Gln Gln His Gln Leu Leu Ser Thr Ala Val
1 5 10 15

His Asp Thr Met Pro Gly Tyr Val Arg Pro Glu Ser Gln Arg Pro
20 25 30

Arg Leu Asp Leu Val Val Ser Asp Ala Arg Ile Pro Val Val Asp Leu
35 40 45

Ala Ser Pro Asp Arg Ala Ala Val Val Ser Ala Val Gly Asp Ala Cys
50 55 60

Arg Thr His Gly Phe Phe Gln Val Val Asn His Gly Ile Asp Ala Ala
65 70 75 80

Leu Ile Ala Ser Val Met Glu Val Gly Arg Glu Phe Phe Arg Leu Pro
85 90 95

Ala Glu Glu Lys Ala Lys Leu Tyr Ser Asp Asp Pro Ala Lys Lys Ile
100 105 110

Arg Leu Ser Thr Ser Phe Asn Val Arg Lys Glu Thr Val His Asn Trp
115 120 125

Arg Asp Tyr Leu Arg Leu His Cys Tyr Pro Leu His Gln Phe Val Pro

130

135

140

Asp Trp Pro Ser Asn Pro Pro Ser Phe Lys Glu Ile Ile Gly Thr Tyr
145 150 155 160

Cys Thr Glu Val Arg Glu Leu Gly Phe Arg Leu Tyr Glu Ala Ile Ser
165 170 175

Glu Ser Leu Gly Leu Glu Gly Gly Tyr Met Arg Glu Thr Leu Gly Glu
180 185 190

Gln Glu Gln His Met Ala Val Asn Tyr Tyr Pro Gln Cys Pro Glu Pro
195 200 205

Glu Leu Thr Tyr Gly Leu Pro Ala His Thr Asp Pro Asn Ala Leu Thr
210 215 220

Ile Leu Leu Met Asp Asp Gln Val Ala Gly Leu Gln Val Leu Asn Asp
225 230 235 240

Gly Lys Trp Ile Ala Val Asn Pro Gln Pro Gly Ala Leu Val Ile Asn
245 250 255

Ile Gly Asp Gln Leu Gln Ala Leu Ser Asn Gly Lys Tyr Arg Ser Val
260 265 270

Trp His Arg Ala Val Val Asn Ser Asp Arg Glu Arg Met Ser Val Ala
275 280 285

Ser Phe Leu Cys Pro Cys Asn Ser Val Glu Leu Gly Pro Ala Lys Lys
290 295 300

Leu Ile Thr Asp Asp Ser Pro Ala Val Tyr Arg Asn Tyr Thr Tyr Asp
305 310 315 320

Glu Tyr Tyr Lys Lys Phe Trp Ser Arg Asn Leu Asp Gln Glu His Cys
325 330 335

Leu Glu Leu Phe Arg Thr
340

<210> 12

<211> 815

<212> DNA

<213> Juglans nigra

<400> 12

gaggatgaga gacccaaggt tgcttacaat caattcagca ctgaaatccc catcatctcg 60
cttgccggga tagacgaagt ccatggccgg aggaccgaga tttgccagaa aatcgatcgag 120
gcctgtgagg actgggttat ttccaggtg gtcgatcatg gcgtcgatgc cagtctaatac 180
tccgacatga cacgtcttgc ccgtgacttc ttccatgc ctcccgagga aaagcttcgt 240
ttcgacatgt ccggccggcaa gaagggcggt ttcattgtct ccagccatct gcaaggagaa 300
gcagtgcag attggcgtga aattgtgaca tatttctcat acccaattag gaccagagac 360
tattcgaggt ggccggacaa gccagaaggg tggagaaagg tgacggagga gtacagtgc 420
aaattgtatgg gactggcatg caaactgttg gaagtgtat cggaggcgat gggatttagag 480
aaggaagcat tgaccaaggc ttgcgtggat atggacaaa aggttgtggtaattactat 540
ccaaaatgtc cacagccaga cctcacattt gggctaaagc gccacacaga tcctggcacc 600
atcaacttgt tggcgtggat ccaggtgggt gggcttcagg ccaccaggaa tggccggcaag 660
acctggatca ctgttcagcc tggcgtggat gcttcgtcg tcaatcttgg agaccatgg 720
catttcgtga gtaacgggag gttcaagaac gctgatcacc aagcagtggtaactcaaac 780
tacagtgcgtatccatgc caccttccaa aacc 815

<210> 13

<211> 815

<212> DNA

<213> Juglans nigra

<220>

<221> CDS

<222> (1)..(813)

<400> 13

gag gat gag aga ccc aag gtt gct tac aat caa ttc agc act gaa atc 48
Glu Asp Glu Arg Pro Lys Val Ala Tyr Asn Gln Phe Ser Thr Glu Ile
1 5 10 15

ccc atc atc tcg ctt gcc ggg ata gac gaa gtc cat ggc cggtt acc 96
Pro Ile Ile Ser Leu Ala Gly Ile Asp Glu Val His Gly Arg Arg Thr
20 25 30

gag att tgc cag aaa atc gtc gag gcc tgt gag gac tgg ggt att ttc 144
Glu Ile Cys Gln Lys Ile Val Glu Ala Cys Glu Asp Trp Gly Ile Phe
35 40 45

cag gtg gtc gat cat ggc gtc gat gcc agt cta atc tcc gac atg aca 192
Gln Val Val Asp His Gly Val Asp Ala Ser Leu Ile Ser Asp Met Thr
50 55 60

cgt ctt gcc cgt gac ttc ttc gcc atg cct ccc gag gaa aag ctt cgt 240
Arg Leu Ala Arg Asp Phe Phe Ala Met Pro Pro Glu Glu Lys Leu Arg
65 70 75 80

ttc gac atg tcc ggc ggc aag aag ggc ggt ttc att gtc tcc agc cat 288
Phe Asp Met Ser Gly Gly Lys Gly Phe Ile Val Ser Ser His

85	90	95	
ctg caa gga gaa gca gtg caa gat tgg cgt gaa att gtg aca tat ttc Leu Gln Gly Glu Ala Val Gln Asp Trp Arg Glu Ile Val Thr Tyr Phe 100	105	110	336
tca tac cca att agg acc aga gac tat tcg agg tgg ccg gac aag cca Ser Tyr Pro Ile Arg Thr Arg Asp Tyr Ser Arg Trp Pro Asp Lys Pro 115	120	125	384
gaa ggg tgg aga aag gtg acg gag gag tac agt gac aaa ttg atg gga Glu Gly Trp Arg Lys Val Thr Glu Glu Tyr Ser Asp Lys Leu Met Gly 130	135	140	432
ctg gca tgc aaa ctg ttg gaa gtg cta tcg gag gcg atg gga tta gag Leu Ala Cys Lys Leu Leu Glu Val Leu Ser Glu Ala Met Gly Leu Glu 145	150	155	480
aag gaa gca ttg acc aag gct tgc gtg gat atg gac caa aag gtt gtg Lys Glu Ala Leu Thr Lys Ala Cys Val Asp Met Asp Gln Lys Val Val 165	170	175	528
gtt aat tac tat cca aaa tgt cca cag cca gac ctc aca ttg ggg cta Val Asn Tyr Tyr Pro Lys Cys Pro Gln Pro Asp Leu Thr Leu Gly Leu 180	185	190	576
aag cgc cac aca gat cct ggc acc atc act ctg ttg ttg cag gac cag Lys Arg His Thr Asp Pro Gly Thr Ile Thr Leu Leu Leu Gln Asp Gln 195	200	205	624
gtg ggt ggg ctt cag gcc acc agg gat ggc ggc aag acc tgg atc act Val Gly Gly Leu Gln Ala Thr Arg Asp Gly Gly Lys Thr Trp Ile Thr 210	215	220	672
gtt cag cct gtt gaa gga gct ttc gtc aat ctt gga gac cat ggt Val Gln Pro Val Glu Gly Ala Phe Val Val Asn Leu Gly Asp His Gly 225	230	235	720
cat ttt ctg agt aac ggg agg ttc aag aac gct gat cac caa gca gtg His Phe Leu Ser Asn Gly Arg Phe Lys Asn Ala Asp His Gln Ala Val 245	250	255	768
gtg aac tca aac tac agt cga ttg tcc atc gcc acc ttc caa aac cc Val Asn Ser Asn Tyr Ser Arg Leu Ser Ile Ala Thr Phe Gln Asn 260	265	270	815

<211> 271
<212> PRT
<213> Juglans nigra

<400> 14

Glu Asp Glu Arg Pro Lys Val Ala Tyr Asn Gln Phe Ser Thr Glu Ile
1 5 10 15

Pro Ile Ile Ser Leu Ala Gly Ile Asp Glu Val His Gly Arg Arg Thr
20 25 30

Glu Ile Cys Gln Lys Ile Val Glu Ala Cys Glu Asp Trp Gly Ile Phe
35 40 45

Gln Val Val Asp His Gly Val Asp Ala Ser Leu Ile Ser Asp Met Thr
50 55 60

Arg Leu Ala Arg Asp Phe Phe Ala Met Pro Pro Glu Glu Lys Leu Arg
65 70 75 80

Phe Asp Met Ser Gly Gly Lys Gly Gly Phe Ile Val Ser Ser His
85 90 95

Leu Gln Gly Glu Ala Val Gln Asp Trp Arg Glu Ile Val Thr Tyr Phe
100 105 110

Ser Tyr Pro Ile Arg Thr Arg Asp Tyr Ser Arg Trp Pro Asp Lys Pro
115 120 125

Glu Gly Trp Arg Lys Val Thr Glu Glu Tyr Ser Asp Lys Leu Met Gly
130 135 140

Leu Ala Cys Lys Leu Leu Glu Val Leu Ser Glu Ala Met Gly Leu Glu
145 150 155 160

Lys Glu Ala Leu Thr Lys Ala Cys Val Asp Met Asp Gln Lys Val Val
165 170 175

Val Asn Tyr Tyr Pro Lys Cys Pro Gln Pro Asp Leu Thr Leu Gly Leu
180 185 190

Lys Arg His Thr Asp Pro Gly Thr Ile Thr Leu Leu Leu Gln Asp Gln
195 200 205

Val Gly Gly Leu Gln Ala Thr Arg Asp Gly Gly Lys Thr Trp Ile Thr
210 215 220

Val Gln Pro Val Glu Gly Ala Phe Val Val Asn Leu Gly Asp His Gly

225

230

235

240

His Phe Leu Ser Asn Gly Arg Phe Lys Asn Ala Asp His Gln Ala Val
245 250 255

Val Asn Ser Asn Tyr Ser Arg Leu Ser Ile Ala Thr Phe Gln Asn
260 265 270